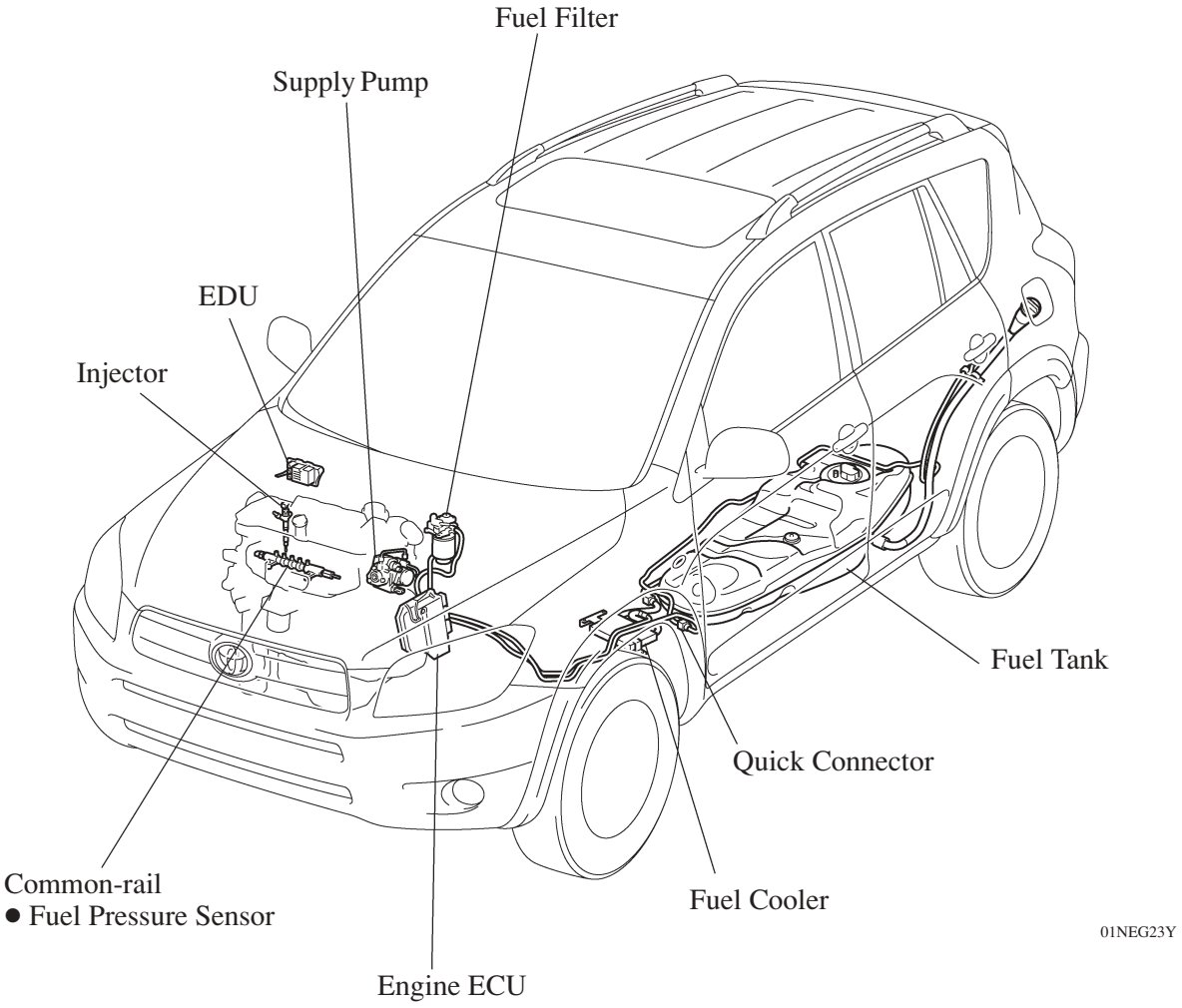
■FUEL SYSTEM

1. General

- A common-rail system is used in the fuel injection system.
- HP3 type supply pump, which is compact and lightweight, is used.
- An injector compensation value and a QR (Quick Response) code are printed on the injector to realize high-precision control.
- A fuel cooler made of aluminum is used.
- A quick connector is used in the fuel main pipe to improve serviceability.

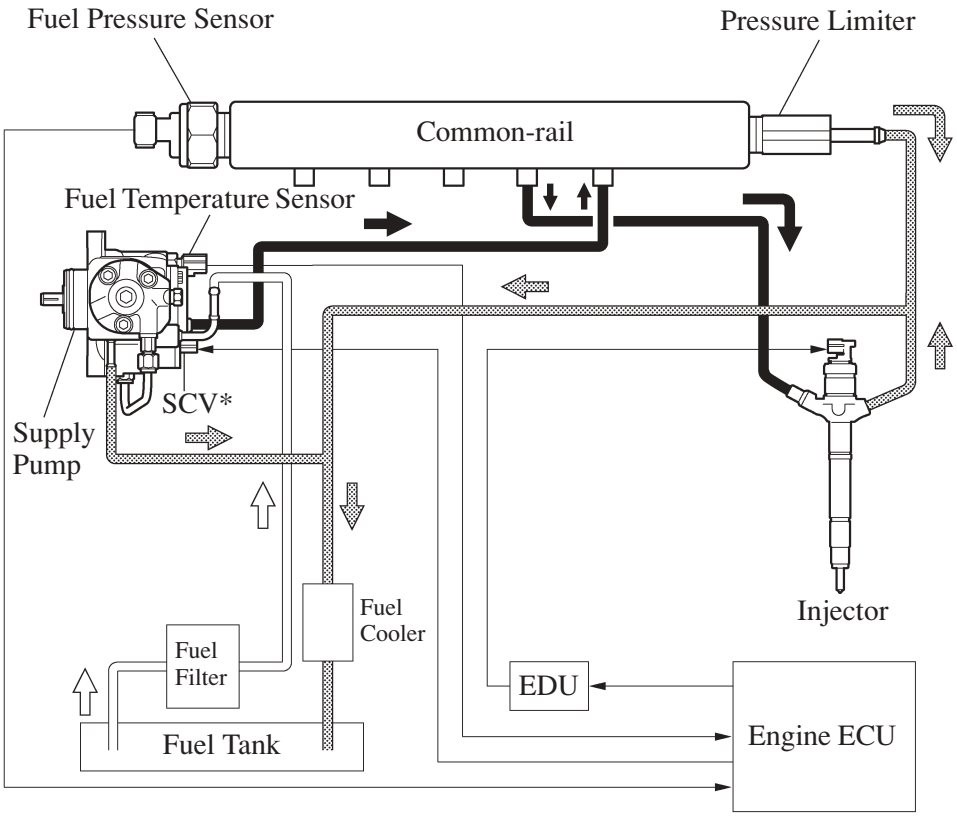


2. Common-rail System

General

In this system, the high-pressurized fuel that is supplied by the supply pump is stored in the common-rail, and the engine ECU sends signals to the injectors by way of the EDU (Electronic Driver Unit) in order to control the injection timing and injection volume. For details of this control, see page EG-94.

▶ System Diagram ◀



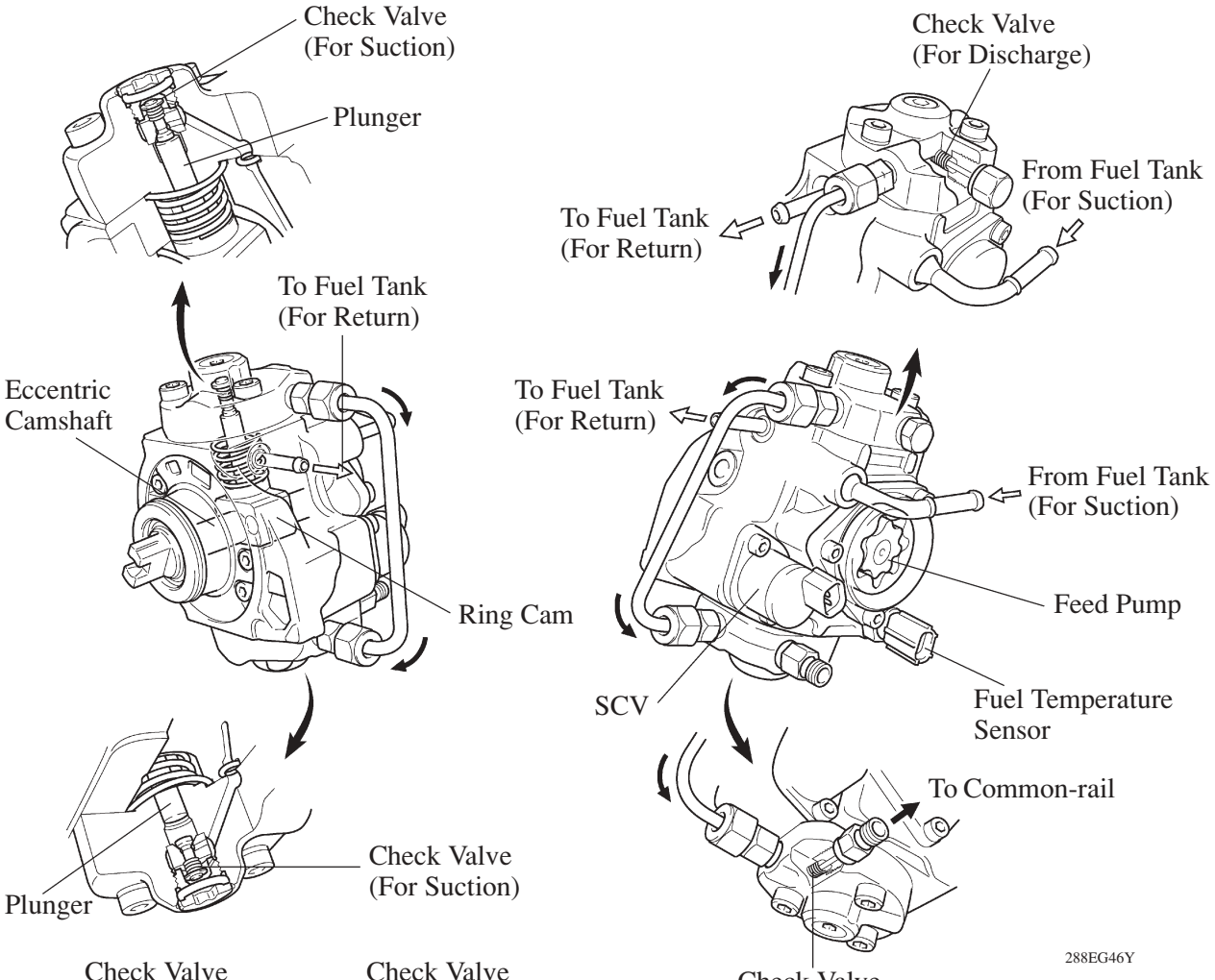
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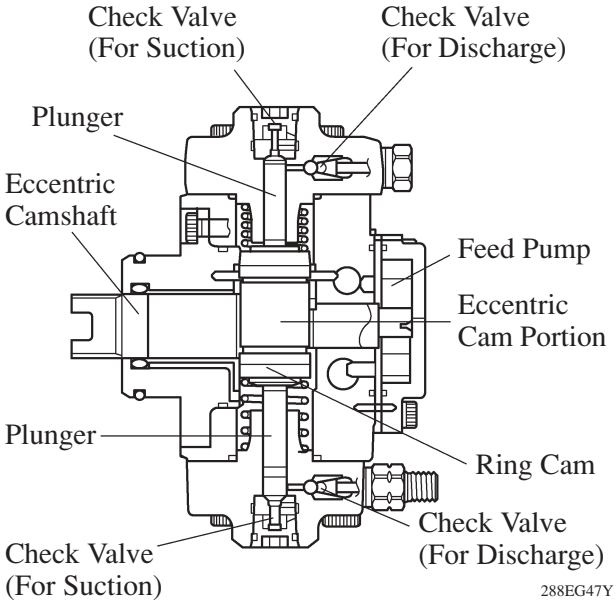
*: Suction Control Valve

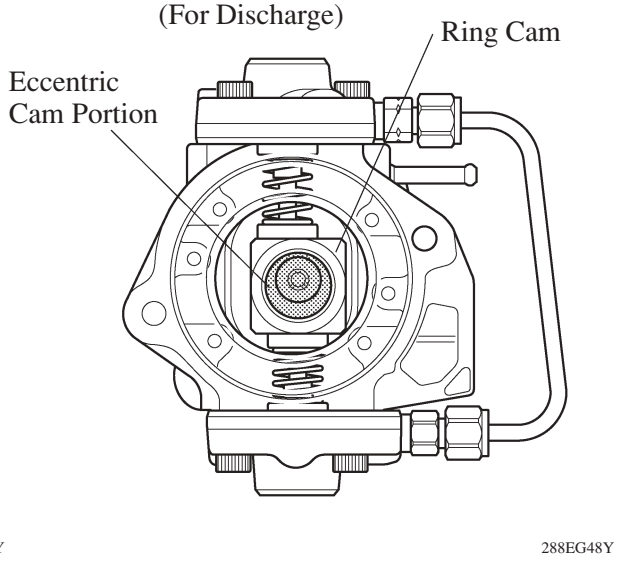
Supply Pump

1) General

- The supply pump consists of eccentric camshaft, ring cam, two plungers, four check valves, SCV (Suction Control Valve), fuel temperature sensor, and feed pump.
- The two plungers are placed opposite each other outside of the ring cam.

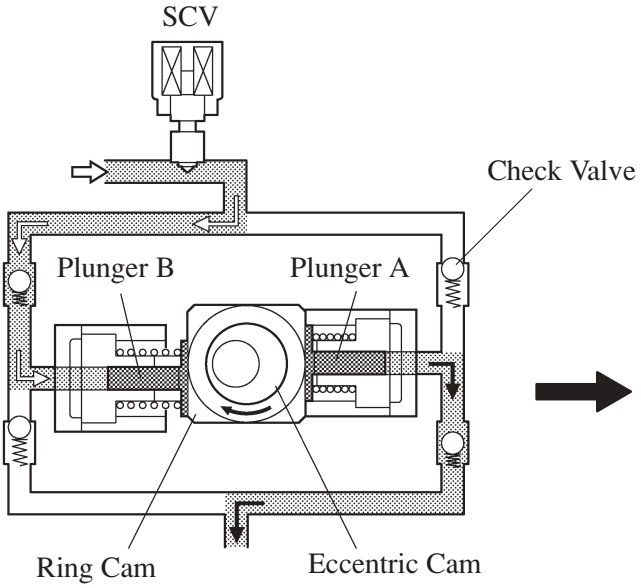






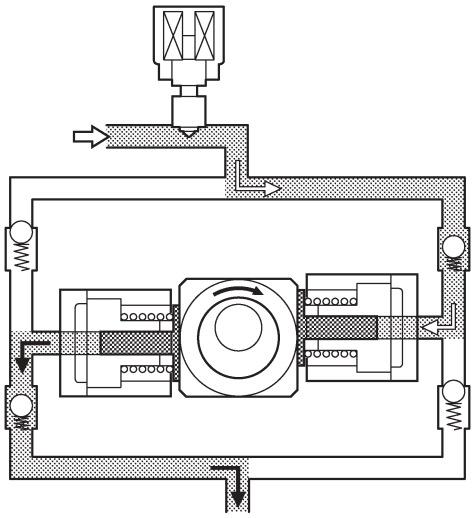
2) Operation

Due to the rotation of the eccentric cam, the ring cam pushes plunger A upward as illustrated below. The force of the spring pulls plunger B (which is located opposite plunger A) downward. As a result, plunger B draws fuel in, and plunger A pumps fuel at the same time.



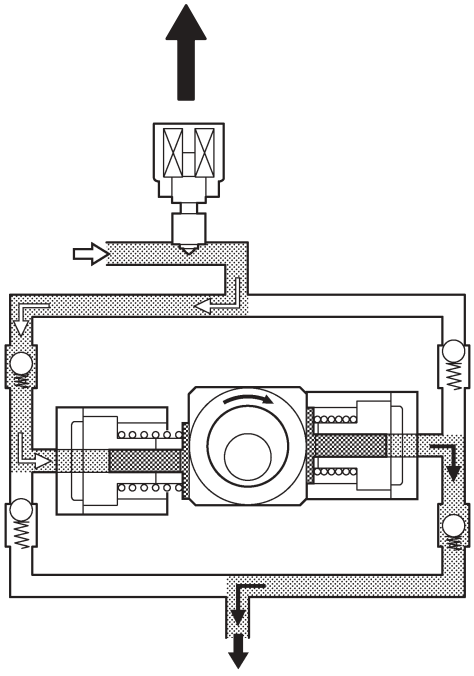
002CV29Y

Plunger A: Pumping End
Plunger B: Suction End



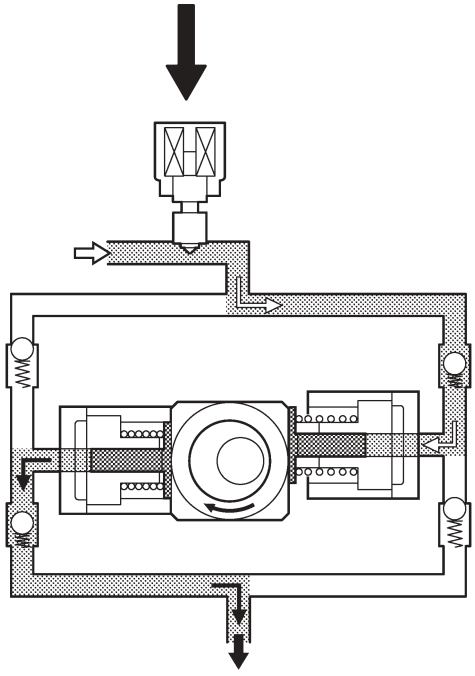
002CV30Y

Plunger A: Suction Start
Plunger B: Pumping Start



002CV32Y

Plunger A: Pumping Start
Plunger B: Suction Start

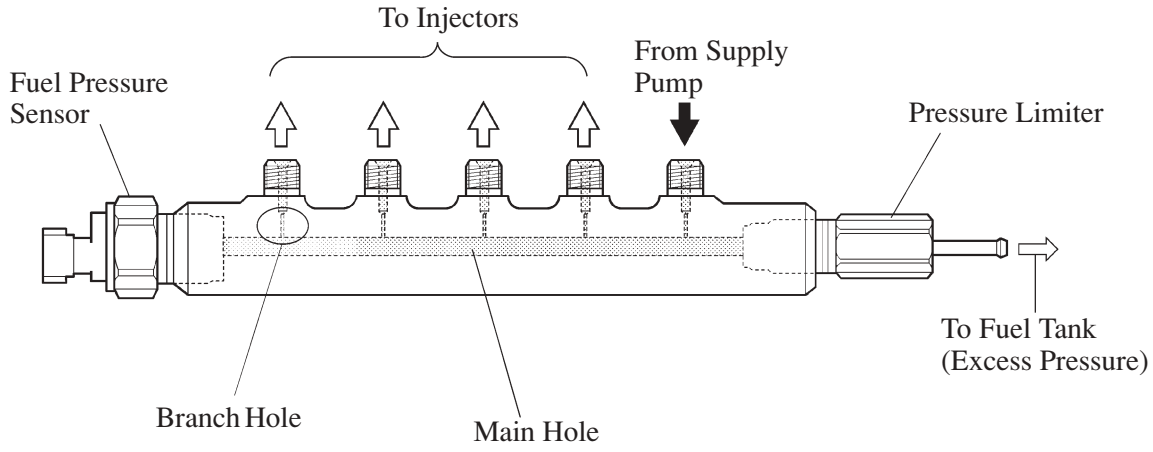


002CV31Y

Plunger A: Suction End
Plunger B: Pumping End

Common-rail

- The function of the common-rail is to store the fuel that has been pressurized by the supply pump. The common-rail is provided with a fuel pressure sensor that detects the fuel pressure in the common-rail, and a pressure limiter that mechanically relieves the pressure in case the internal pressure of the common-rail rises abnormally.
- Internally, the common-rail contains a main hole and five branch holes that intersect the main hole. Each branch hole functions as an orifice that dampens the fluctuation of the fuel pressure.
- The fuel pressure sensor outputs a signal that represents the fuel pressure in the common-rail to the engine ECU in order to constantly regulate the fuel at an optimal pressure.



Service Tip

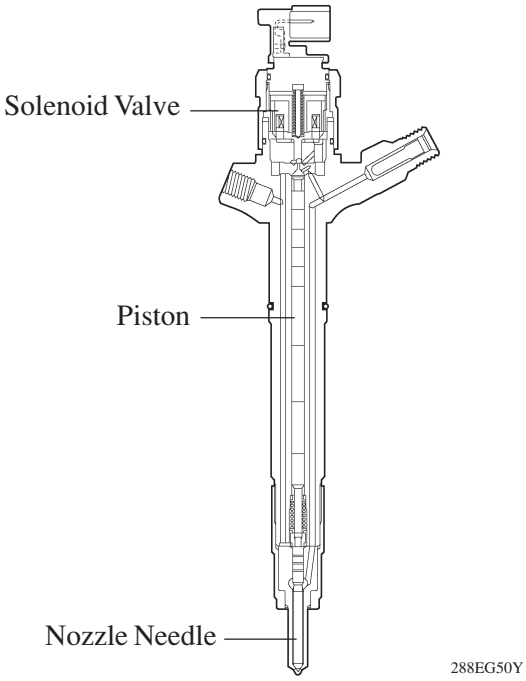
- Fuel pressure sensor has its sealing portion plastic-deformed in order to keep sealing performance, so do not reuse it after disassembling.
- The fuel pressure sensor and pressure limiter are supplied as a set with the common-rail.
- Do not disassemble the pressure limiter and fuel pressure sensor.
- If parts that affect the alignment have been changed, make sure to replace the pipe with a new one as well. The parts that require the replacement of a pipe are listed below.
  Injection Pipe: Injector, Common-rail, Cylinder Head and Intake Manifold
  Fuel Inlet Pipe: Supply Pump, Common-rail, Cylinder Head and Intake Manifold

For details, refer to the RAV4 Repair Manual (Pub. No. RM01N0E).

Injector

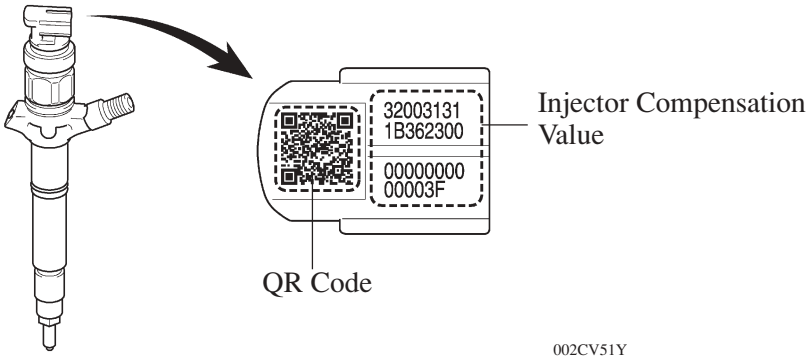
1) General

- The injector consists of a nozzle needle, piston, and solenoid valve.
- An injector compensation value and QR (Quick Response) code containing encoded characteristics of the injector are printed on each injector.
- The injector compensation value and QR code contain various pieces of information regarding the injector, such as model code and injection volume correction.



Service Tip

- If the engine ECU is replaced, use the intelligent tester II and input the injector compensation values of all 4 injectors. If one of the injectors is replaced, input the injector compensation value of the replaced injector. Then, the proper compensation will be made so that the injection volume precision prior to the replacement will remain unchanged. For details, refer to the RAV4 Repair Manual (Pub. No. RM01N0E).
- The QR code, which requires a special scan tool, is not used at Toyota dealers.



– REFERENCE –

What is QR (Quick Response) Code?

- *QR code, a matrix symbology consisting of an array of nominally square cells, allows omni-directional, high-speed reading of large amounts of data.*
- *QR code encodes many types of data such as numeric, alphanumeric, kanji, kana and binary code. A maximum of 7,089 characters (numeric) can be encoded.*
- *QR code (2D code) contains information in the vertical and horizontal direction, whereas a bar code contains data in one direction only. QR code (2D code) holds a considerably greater volume of information than a bar code.*

2) Operation

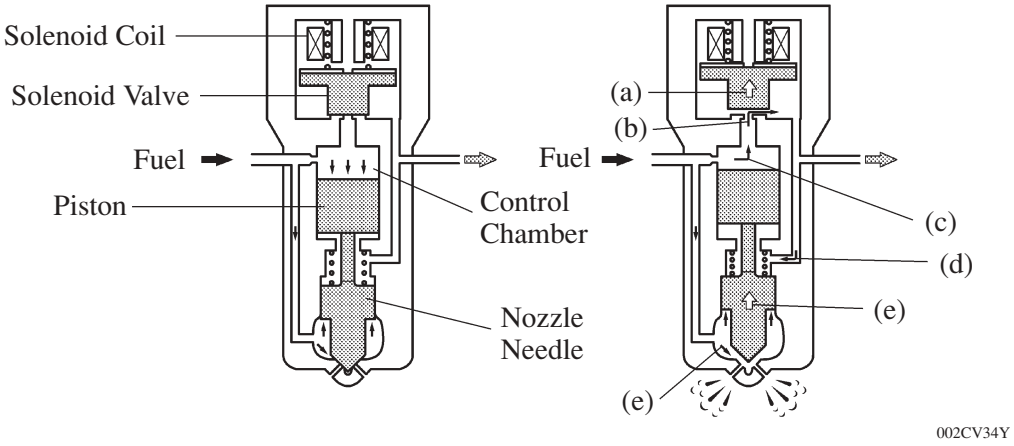
(a) When electrical current is applied to the solenoid coil, it pulls the solenoid valve up.

(b) The orifice of the control chamber opens, allowing the fuel to flow out.

(c) The fuel pressure in the control chamber drops.

(d) Simultaneously, fuel flows from the orifice to the bottom of the piston and raises the piston up (to enhance response).

(e) As a result, the piston raises the nozzle needle to inject fuel.



3. Fuel Cooler

The fuel cooler, which is provided in the fuel return path, cools the return fuel that has reached a high temperature as a result of the pumping of the supply pump. This prevents the reduction in fuel viscosity that is caused by the rise in fuel temperature, and improves the reliability of the fuel system.

